Lat 39.84489 Lon -120.41798

Forest Health Protection

Pacific Southwest Region

Date: September 29, 2002
File Code: 3420

To: Michael De Lasaux, Natural Resources Advisor,
UC Cooperative Extension, Plumas & Sierra Counties

Subject: Incense cedar mortality (FHP Report NE02-08)

At your request and the request of Jack Bridge, Development Consultant, I visited the Grizzly Creek area near Portola (Plumas County) on August 29, 2002. In this area, the construction of a new golf course and country club is currently underway. The objective of my visit was to identify the cause of the incense cedar mortality occurring on the property and to provide management recommendations as appropriate.

Background

The Grizzly Creek development is located about 1.5 miles northeast of Portola on Grizzly Creek Road and encompasses approximately 1,000 acres of forested land. This development will eventually include an 18-hole golf course and roughly 400 home sites. The gently to steeply sloped property has a mostly southwestern aspect and an elevation range of about 4,950 to 6,000 feet. Precipitation averages 20" to 25" per year. Ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*Pinus jeffreyi*) dominate the lower elevations and are mixed with incense cedar (*Libocedrus decurrens*), Douglas fir (*Psuedotsuga menziesii*), and white fir (*Abies concolor*) at the upper elevations. California black oak (*Quercus kelloggii*) is sparsely scattered throughout the site. Trees sizes range from approximately 1" to 16" in diameter. Several large old stumps exist on

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the property revealing the historic logging of the predominant overstory trees. The existing stands consist primarily of densely spaced small diameter trees, especially at the upper elevations. Recent thinning has occurred on approximately half of the acres resulting in stocking levels more appropriate for the site. In addition, hand piling of dead and down material has significantly reduced the amount of surface and ladder fuels. Thinning and fuels treatments are planned for most of the remaining acres.

Observations

Most cedar trees on the property are exhibiting some level of branch, twig and foliage dieback, or in some cases, have entire crowns fading. Cedar trees in both thinned and unthinned stands are exhibiting these symptoms. Many of the dead cedar have been felled and/or removed during thinning operations. Examination of a felled tree revealed only woodborer galleries in the bole. Examination of dead and dying branches of living trees did not reveal evidence of bark beetle or woodborer activity. Most cedar trees on the property, including ones that are dying, are infected by incense cedar rust (*Gymnosporangium libocedri*). Many of the larger trees have multiple brooms scattered throughout their crowns. Most of these brooms contain yellowing foliage or are completely dead.

Observations of insect and disease problems associated with other tree species was limited to scattered dwarf mistletoe (*Arceuthobium sp.*) in pine and limited fir engraver beetle (*Scolytus ventralis*) activity in white fir. A potential disease problem was also identified, as stumps created from thinning activities were not subsequently treated with a borate product such as Sporax and therefore may be susceptible to infection by annosus root disease (*Heterobasidion annosum*).

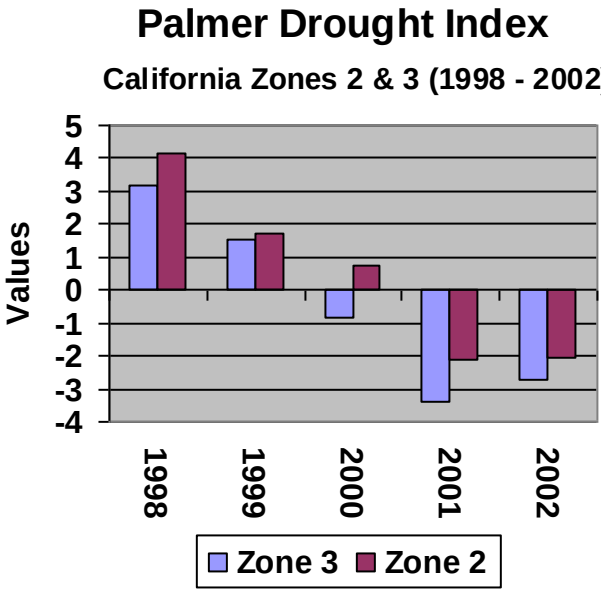
Discussion

The Palmer Drought Index for northeastern California indicates that this area is experiencing the third consecutive year of drought conditions ranging from moderate to extreme (Figure 1). Conditions such as these typically result in increased tree stress and higher levels of insect and disease related mortality. This is especially true for trees growing in overstocked stands and trees growing on poorer sites. In most cases, once tree mortality begins to occur in an area, few management options are available to limit its extent. The best way to prevent mortality is to promote the long-term health and vigor of trees. This can be done by limiting stand density, controlling the spread of diseases such as dwarf mistletoe, minimizing soil compaction and tree injury during management activities and promoting a diverse mix of tree species and ages appropriate for the site.

The mortality and declining health observed in the incense cedar is most likely related to the exceptionally dry conditions the area is experiencing. Although incense cedar is considered to be somewhat drought tolerant and insect resistant, an increase in mortality can be expected during extended periods of below normal precipitation. Trees growing in overstocked stands, such as those found at the Grizzly Creek area, are at an even greater risk of mortality as increased competition for limited moisture results in tree stress. This stress can kill trees outright or weaken them enough to allow for successful attack by bark and engraver beetles (Family

Scolytidae) and/or woodboring beetles (Families Buprestidae and Cerambycidae). Mortality should be expected to continue in dense stands until normal precipitation returns to the region. Stands that were thinned over the last couple of years may still experience mortality until trees are able to take advantage of their increased growing space and recover from root and bole injuries that they may have incurred during treatment.

Figure 1. Annual Palmer Drought Indices for NE California Zones 2 & 3 (1998-2002)



Palmer Classifications
4.0 or more extremely wet
3.0 to 3.99 very wet
2.0 to 2.99 moderately wet
1.0 to 1.99 slightly wet
0.5 to 0.99 incipient wet spell
0.49 to -0.49 near normal
-0.5 to -0.99 incipient dry spell
-1.0 to -1.99 mild drought
-2.0 to -2.99 moderate drought
-3.0 to -3.99 severe drought
-4.0 or less extreme drought

Infection of incense cedar at Grizzly Creek by incense cedar rust would generally not result in tree mortality during periods of normal to above normal precipitation as this disease rarely causes any more damage then scattered dieback of small branches. However, when combined with moisture stress, these trees are at a higher risk than uninfected trees and a continuation of the extremely dry conditions may result in further mortality. To reduce future mortality, select heavily infected trees (trees with many brooms), for removal during thinning operations.

There is a slight chance that annosus root disease may be a future concern in the Grizzly Creek area, as tree stumps created during the recent thinning activities were not treated with a borate compound such as Sporax to prevent infection. Annosus root disease can enter healthy conifer roots when fungal spores land and germinate on freshly cut stumps. Once the fungus is established in the infected stumps it can spread, via root-to-root contact, to residual trees within the stand. This spread progresses radially at a rate of about 1 foot per year. Relative susceptibility of conifer stumps to infection increases with diameter. Since most stumps in the thinned areas are small (< 8" in diameter) the likelihood of initiation of new infection centers is in the Grizzly Creek area is low.

Two strains of *H. annosum* exist. The p-type occurs mainly on pine, incense cedar, hardwoods and brush. The s-type infects mostly firs, spruce, Douglas fir, western red cedar, giant sequoia and hemlock. Pine trees are usually killed quickly by annosus root disease whereas white fir is

rarely killed, except by root failure or secondary engraver beetle attack. The p-type annosus infects the sapwood and cambium of pine while the s-type infects the heartwood of white fir. Infected white fir can survive a long time and appear healthy as long as they are not under stress, as the fungus can decay much of the roots and butt without killing or seriously weakening the tree. Annosus root disease in incense cedar can be a concern due to extensive decay of the roots and butt; however, it is not typically considered an important mortality agent. Infected trees in this condition are prone to wind throw and can present a serious hazard in recreational areas and around homes.

To prevent infection of healthy roots, it is recommended that ALL freshly cut stumps in the Grizzly Creek area, even stumps that are re-cut flush with the ground for aesthetics, be treated with a borate compound that prevents the fungus from growing into the roots through the stumps. Sporax is the trade name for the powdered borax that is currently listed with EPA for use as a stump treatment for preventing annosus root disease.

Maintaining and promoting healthy trees are important objectives of the development plan for the Grizzly Creek area. Care should be taken during home and golf course construction to minimize negative impacts on the landscape. The following guidelines should be applied for areas under construction or in areas where future construction will take place.

- Tree density should be appropriate for the site. This will provide access to light, moisture and nutrients and allow the trees to better cope with their altered environment.
- Trees that will directly interfere with structures or that will be seriously damaged during construction or excavation should be removed.
- Leave a mixture of ages and species to provide a continual forest canopy over the years.
- Fence off individual or groups of trees before construction to negate or minimize root damage by soil compaction or trunk and root damage by equipment. Protective fences should be placed, at a minimum, at drip line. Depending on the species, tree roots can exist within a radius two times the crown radius and encompass an area well beyond drip line. Drip line is defined by the outer edge of the foliage.
- Road or lot grades should be changed as little as possible. Grading damages roots and can set up conditions that favor soil erosion. It can also alter the contour such that the flow of surface and subsurface water is drastically affected.
- Trenches should always be dug away from tree roots.
- Do not back fill with earth or rocks around the trunks of trees.
- Choose herbicides and fertilizers carefully and do not apply them in areas where drainage patterns have been altered allowing the chemical to concentrate around individual trees.
- Avoid paving with either concrete or asphalt over root systems, or close to the trunks of trees.
- Use caution in applying wood preservatives and other chemicals to buildings. Trees and other plants have been killed by direct contact with them or as a result of their runoff in rainwater.
- Frequent watering required by lawns, golf fairways, or other vegetation can be destructive to existing trees.
- Avoid leaving green pine slash on site to prevent the build up of pine engraver (*Ips pini*) beetle populations that may attack standing green trees.

Existing or future construction that incorporates the above guidelines will help assure the existence of vigorous and healthy trees following project completion.

If you have any questions regarding this report and/or need additional information please contact me at 530-252-6431 or at dcluck@fs.fed.us.

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